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PATENT APPLICATION
Docket: 15689.49.1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND
INTERFERENCES

In re application of		)
	Takehiro Nakamura et al.	)
Serial No.:	10/673,683	) Art Unit) 2611
Filed:	September 29, 2003	)
Conf. No.:	4169	)
For:	BASE STATION IN MOBILE COMMUNICATION SYSTEM	)
Examiner:	Kevin Kim	)
Customer No.:	022913	)

BRIEF OF APPELLANT

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

This Appeal Brief is filed in response to the Notification of Non-Compliant Appeal Brief mailed March 18, 2010. On November 3, 2009, Appellant timely filed a Notice of Appeal from the action of the Examiner in finally rejecting pending claims 5–10 in this application. An Appeal Brief was timely filed March 1, 2010, under the provisions of 37 C.F.R. § 41.37 and was timely as a response to a Request for Pre-Appeal Brief Conference was mailed January 29, 2010. The Filing Fee of $540, as set forth in 37 C.F.R. § 41.20(b)(2), has been previously submitted.

(The Commissioner is hereby authorized to charge payment of any fees that may be applicable to this communication to Deposit Account No. 23-3178.)

I. REAL PARTY IN INTEREST

The real party in interest in the present appeal is NTT DoCoMo, Inc., the assignee of the subject application

II. RELATED APPEALS AND INTERFERENCES

Appellant, appellant's representative, and/or the assignee of the present application are not aware of any related appeals or interferences.

III. STATUS OF CLAIMS

Claims 1–4 have been cancelled and are no longer pending.

Claims 5–10 stand rejected by the Examiner. The rejection of claims 5–10 is being appealed.

IV. STATUS OF AMENDMENTS

No claim amendments have been submitted or have been entered after the Final Office Action.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The appealed claims are directed to methods and devices for transmitting a signal at plural types of transmission rates wherein the ratio of pilot symbols to the total number of symbols varies and becomes smaller for a high transmission rate than for a low transmission rate.

The independent claims on appeal are claims 7 and 9.

Support for independent claim 7 (on appeal) may be found, *inter alia*, in Specification ¶¶ 0006, 0225–0232 and Figures 4A–4B, 5–6, and 7A–7B.

Support for independent claim 9 (on appeal) may be found, *inter alia*, in Specification ¶¶ 0006, 0225–0232 and Fig's 4A–4B, 5–6, and 7A–7B.

Independent claim 7, an apparatus for transmitting a signal at plural types of transmission rates, recites:

Claim 7. A transmission apparatus for transmitting a signal at plural types of transmission rates, comprising:

signal generation means for generating a signal to be transmitted into which pilot symbols which are predetermined patterns have been inserted, such that a ratio of the number of the pilot symbols to the total number of symbols in a single slot of the signal becomes smaller in a case where a transmission rate of the signal is high, than that in a case where the transmission rate is low; and

transmission means for transmitting the generated signal.

Independent claim 9, a method for transmitting a signal at plural types of transmission rates, recites:

Claim 9. A transmission method for transmitting a signal at plural types of transmission rates, comprising:

a signal generation step of generating a signal to be transmitted into which pilot symbols which are predetermined patterns have been inserted, such that a ratio of a number of the pilot symbols to the total number of symbols in a single slot of the signal becomes smaller in a case where a transmission rate of the signal is high, than that in a case where the transmission rate is low; and

a transmission step of transmitting the generated signal.

Notably, each independent claim recites plural types of transmission rates (i.e., multiple different transmission rates) and a ratio of pilot symbols to total symbols in the transmitted signal which varies in accordance with the transmission rate of the signal.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Did the Examiner err in rejecting pending claims 5–10 under 35 U.S.C. § 103(a) as being unpatentable over Marchetto et al., United States Patent No. 5,914,959 ("Marchetto") in view of Hassan, United States Patent No. 5,901,185 ("Hassan")?

VII. ARGUMENT

1. Introduction

Each of the claims at issue is directed toward transmitting a signal at plural types of transmission rates. Each claim at issue includes the limitation that "pilot symbols . . . have been inserted" into a signal to be transmitted "such that a ratio of a number of the pilot symbols to the total number of symbols in a single slot of the signal becomes smaller in a case where a transmission rate of the signal is high, than that in a case where the transmission rate is low." *See* independent claims 7 & 9. In other words, the claims recite that for plural (i.e., multiple) transmission rates, a ratio of pilot symbols to total number of symbols varies for different transmission rates such that the ratio becomes smaller for a high transmission rate than for a lower transmission rate.

Although the Examiner concedes that the prior art fails to explicitly teach the ratio of pilot symbols to total symbols becomes smaller for a high transmission rate than for a lower transmission rate, the Examiner incorrectly supplies this limitation without a proper basis.

2. The Examiner errs in concluding that it would have been obvious to one skilled in the art at the time the invention was made that, for transmitting a signal at plural types of transmission rates, generating a signal to be transmitted into which pilot symbols have been inserted, such that a ratio of the number of the pilot symbols to the total number of symbols in a single slot of the signal becomes smaller in a case where a transmission rate of the signal is high, than that in a case where the transmission rate is low.

Inserting pilot symbols into a signal in such a variable scheme such that the ratio of pilot symbols to total number of symbols becomes smaller for a high transmission rate than for a lower transmission rate is neither explicitly taught by the prior art nor is it obvious in light of the prior art.

The Examiner rejected each of the appealed claims 5–10, of which claims 7 and 9 are independent claims, under 35 U.S.C. § 103(a) as being unpatentable over Marchetto et al., United States Patent No. 5,914,959 ("Marchetto") in view of Hassan, United States Patent No. 5,901,185 ("Hassan"). *See* Final Office Action p. 3 (paper no. 20090803, mailed Aug. 4, 2009) ("FOA"). The Examiner concedes that Marchetto fails to teach that a ratio of the number of the pilot symbols to the total number of symbols in a single slot of the signal becomes smaller in a case where a transmission rate of the signal is high, than that in a case where the transmission rate is low. FOA p. 4. The Examiner also concedes that "Hassan . . . does not explicitly teaches (sic) the ratio of pilot symbols in a slot to total symbols in the slot is smaller in a higher rate than in a lower rate." FOA p. 2.

However, citing Hassan col. 4 l. 48–64, the Examiner asserted that "Hassan teaches that an appropriate (in other words, optimal) number of pilot symbols should be used for reducing the bit error rate and, at the same time, overhead." *See* FOA p. 4. Hassan col. 4 l. 48–64 reads:

> "In order to reduce the bit error rate, pilot symbols may be inserted in the symbol sequence at a smaller intervals to reduce the separation between the pilot symbols and to increase the accuracy of the estimated channel transfer characteristic. As pilot symbols generally have no information content, however, increasing the frequency of pilot symbols in the transmitted symbol sequence can reduce the potential information capacity of the channel, which may in turn reduce the number of channels which can provided in the system and the quality of each channel. Adding pilot symbols may also reduce power efficiency by wasting transmit power in non-informational symbols. In addition, the optimal interpolating filter which is generally needed to recognize the full benefit of PSAM may have hundreds of taps and may present practical difficulties in implementation."

Hassan col. 4 l. 48–64.

So, the cited portion of Hassan suggests that increasing the ratio of pilot symbols to total number of symbols (i.e., increasing the frequency of pilot symbols in a transmitted symbol sequence) may have the beneficial effect of increasing the accuracy of the estimated channel transfer characteristic. However, Hassan also suggests increasing the ratio of pilot symbols to increase accuracy may also have undesirable effects which may include "reduc[ing] the potential information capacity of the channel," "reduc[ing] the number of channels which can provided," "reduc[ing] . . . the quality of each channel," and "reduc[ing] power efficiency by wasting transmit power in non-informational symbols." *See* Hassan col. 4 l. 48–64. Notably, the cited portion of Hassan (as well as its entirety) does not teach, as the Examiner has asserted, "that an *appropriate* (in other words, *optimal*) *number* of pilot symbols should be used for reducing the bit error rate." FOA p. 4 (emphasis added).

From the Examiner's own characterization of Hassan's discussion of the possible adverse effects of increasing the frequency of pilot symbols in a transmitted symbol sequence (but not Hassan, itself), the Examiner then concludes that:

> "Since it is desirable to minimize the number of pilot (sic) in order to reduce overhead, when *a same number of pilot symbols* is used for high and low transmission rates, the ratio of the optimized number of pilot symbols to the total number of symbols would have been smaller when the transmission rate is higher than it is when the transmission rate is lower. Thus it would have been obvious to one skilled in the art at the time the invention was made to select an appropriate number of pilot symbols for each of the transmission rates in the communication system of Marchetto et al, as suggested by Hassan, whereby the ratio of the number of the pilot symbols to the total number of symbols in a single slot of the signal becomes smaller when the transmission rate is high than it is when the transmission rate is low."

FOA pp. 4–5 (emphasis added).[1]

[1] Notably, the Examiner's assertions also seem to be contradictory. In one sentence, the Examiner asserts that "when *a same number of pilot symbols is used for high and low transmission rates*, the ratio of the optimized number of pilot symbols to the total number of symbols would have been smaller when the transmission rate is higher than it is when the transmission rate is lower." FOA p. 4 (emphasis added). However, in another sentence, the Examiner asserts that "it would have been obvious to one skilled in the art at the time the invention was made to *select an appropriate number of pilot symbols for each of the transmission rates*." FOA p. 4 (emphasis added).

This is in error. The examiner has impermissibly supplied a limitation which is not taught or suggested by the cited combination of references. Hassan (in combination with Marchetto) does not teach or suggest finding an "optimal" number of pilot symbols to be used for high and low transmission frequencies.[2] Further, Hassan (in combination with Marchetto) does not teach or suggest using a same (i.e., fixed) number of pilot symbols for high and low transmission rates (such that the ratio of pilot symbols to total symbols would be lower at a higher transmission rate). Further still, "using a same number" of pilot symbols is not one of a finite number of identified, predictable solutions and is not, in fact, how the invention actually works.

In view of the file history, it appears that the Examiner has relied on the "obvious to try" test of KSR Int'l Co. v. Teleflex, Inc., 550 U.S. 398 (2007). *See* FOA p. 3 ("one skill (sic) in the art has only a finite number of selecting pilot symbols"). According to MPEP § 2141 III (E), a rationale supporting a conclusion of obviousness is "'Obvious to try' – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success."

However, "a ratio of the number of pilot symbols to the total number of symbols in a single slot of the signal becomes smaller in a case where a transmission rate of the signal is high, than that in a case where the transmission rate is low," as recited in independent claims 7 and 9, is not a result of choosing from a finite number of identified, predictable solutions. (Nor can this limitation be arrived at by any of the other exemplary rationales discussed in MPEP § 2141 III.)

The recited limitation defines a tendency in which the ratio of pilot symbols to the total number of symbols should be smaller when the transmission rate is high than when the transmission rate is low. A ratio which is smaller for a higher transmission rate than for a lower transmission rate does not belong to a finite number of identified, predictable solutions. Further, the combination of cited references fails to teach or suggest such a tendency of a ratio of pilot symbols to the total number of symbols which decreases as transmission rate increases. Prior to the inventors finding such a tendency, those skilled in the art could not and did not predict that there was such a tendency or that such a tendency would be useful or beneficial.

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[2] Hassan never mentions seeking or determining an "appropriate" or "optimal" number of pilot symbols. *See, generally*, Hassan. As a matter of fact, Hassan apparently ignores varying the ratio of pilot symbols for different transmission rates (as increasing the ratio of pilot symbols for some rates may have adverse consequences; *see* Hassan col. 4 l. 48–64) and, instead, teaches alternative ways of increasing the accuracy of the estimated channel transfer characteristic. *See* Hassan Abstract; *see also* Hassan col. 4 l. 65 to col. 6 l. 45; *see also* Hassan Fig's 8 and

Further, there was no reasonable expectation of success in finding the tendency defined in the claims or that a ratio of pilot symbols to the total number of symbols being smaller when the transmission rate is high than when the transmission rate is low would be useful or beneficial. Prior to the inventors finding such a tendency, those skilled in the art could not and did not predict that a ratio that was smaller for higher frequencies than for lower frequencies would be useful.

Because there was not a finite number of identified solutions and because the ratio identified in the claims was not predictable, the Examiner's reasoning and conclusions constitute impermissible hindsight including knowledge gleaned only from the Applicants' disclosure.

The Examiner states "when *a same number* of pilot symbols is used for high and low transmission rates, the ratio of the optimized number of pilot symbols to the total number of symbols would have been smaller when the transmission rate is higher that it is when the transmission rate is lower." FOA p. 4 (emphasis added). However, the Examiner's assumption that the number of pilot symbols is fixed (i.e., "a same number of pilot symbols is used for high and low transmission rates") is no more than a presumption and, further, is incorrect. Although the Examiner does not explicitly clarify which "same number of pilot symbols" is intended, it appears that the Examiner intends that "a same number of pilot symbols" *per time slot* is used for both high and low transmission rates.[3]

However, according to Specification § 4.1.2.3, "Signal Formats of the Physical Channels," in conjunction with Fig's 5–6, the optimal numbers of pilot symbols per time slot *varies depending on the symbol rates*. *See* Specification ¶¶ 0228–0229. For example, six pilot symbols per time slot are used for the symbol rate of 32 ksps (kilosymbols per second), and 16 pilot symbols per time slot are used for the symbol rate of 128 ksps. Specification ¶¶ 0228–0229. This is clearly not, as the Examiner has asserted and relies upon for his conclusion, "a same number of pilot symbols." FOA p. 4.

Further, as described in Specification Fig's 5–6 and associated text, the horizontal axis represents the number of pilot symbols contained in each time slot whereas the vertical axis represents a necessary Eb/Io in a state that meets a quality required, where Eb is the required

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11A–11C and associated text. Notably, the ratio of pilot symbols in Hassan Fig's 11A–11C remains constant at one pilot symbol to nine information symbols. *See* Hassan Fig's 11A–11C.

received power per bit after the error correction and Io is the interference power per unit frequency band. As shown in Fig. 5 for 32 ksps, when the number of pilot symbols per time slot are six, the Eb/Io is minimum. As shown in Fig. 6 for 128 ksps, when the number of pilot symbols per time slot are 16, the Eb/Io is minimum. The Specification summarizes "The optimum number of the pilot symbols *varies depending on the symbol rates*, such as six for 32 ksps and 16 for 128 ksps." Specification ¶ 0229 (emphasis added). Therefore, the number of the pilot symbols per time slot for a high transmission rate is not, as the Examiner asserts, the same number as that for a low transmission rate. Thus, the Examiner's assumption is demonstrably incorrect and cannot be relied upon for his conclusion that the ratio will decrease as the transmission rate increases.

3. Summary

For the foregoing reasons, the Applicants submit that there is a clear deficiency in the Examiner's asserted *prima facie* case in support of rejection of claims 5–10 under 35 U.S.C. § 103(a) as being unpatentable over Marchetto in view of Hassan. The Examiner has impermissibly supplied limitations which are not taught or suggested by the prior art and has relied upon incorrect assumptions in order to arrive at his conclusions. Accordingly, the Applicants respectfully request the final rejections of the Examiner be overturned by the Board. As the rejections under 35 U.S.C. § 103 in view of Marchetto and Hassan are the only remaining rejections, the Applicants also request the claims be allowed as currently presented.

[3] The Examiner stated that "it would have been obvious . . . to select an appropriate number of pilot symbols for each of the transmission rates . . . whereby the ratio of the number of the pilot symbols to the total number of symbols *in a single slot* . . . becomes smaller . . . ." FOA pp. 4–5 (emphasis added).

CONCLUSION

For the foregoing reasons, Appellant respectfully requests the Board to overturn the Examiner's rejections of appealed claims 5–10.

The Commissioner is hereby authorized to charge payment of any of the following fees that may be applicable to this communication, or credit any overpayment, to **Deposit Account No. 23-3178**: (1) any filing fees required under 37 CFR § 1.16; (2) any fees required by 37 CFR § 41.20; or (3) any patent application and reexamination processing fees under 37 CFR § 1.17.

Dated 16th day of April, 2010,

Respectfully submitted,

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CLAIMS APPENDIX

Claims 1 – 4. (Cancelled).

Claim 5. (Previously Presented) A communication system comprising the transmission apparatus as claimed in Claim 7, and a reception apparatus for receiving the transmitted signal, wherein:

the reception apparatus comprises:

reception means for receiving the transmitted signal; and

coherent detection means for carrying out coherent detection by using the pilot symbols included in the received signal.

Claim 6. (Previously Presented) The communication system as claimed in claim 5, wherein the signal generation means generates the signal to be transmitted into which the pilot symbols have been inserted, such that accuracy of coherent detection is maintained.

Claim 7. (Previously Presented) A transmission apparatus for transmitting a signal at plural types of transmission rates, comprising:

signal generation means for generating a signal to be transmitted into which pilot symbols which are predetermined patterns have been inserted, such that a ratio of the number of the pilot symbols to the total number of symbols in a single slot of the signal becomes smaller in a case where a transmission rate of the signal is high, than that in a case where the transmission rate is low; and

transmission means for transmitting the generated signal.

Claim 8. (Previously Presented) The transmission apparatus as claimed in claim 7, wherein the signal generation means generates the signal to be transmitted into which the pilot symbols have been inserted, such accuracy of coherent detection is maintained.

Claim 9. (Previously Presented) A transmission method for transmitting a signal at plural types of transmission rates, comprising:

a signal generation step of generating a signal to be transmitted into which pilot symbols which are predetermined patterns have been inserted, such that a ratio of a number of the pilot symbols to the total number of symbols in a single slot of the signal becomes smaller in a case where a transmission rate of the signal is high, than that in a case where the transmission rate is low; and

a transmission step of transmitting the generated signal.

Claim 10. (Previously Presented) The transmission method as claimed in claim 9, wherein the signal generation step generates the signal to be transmitted into which the pilot symbols have been inserted, such that accuracy of coherent detection is maintained.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.